Genomic Signal Processing (GSP) is the engineering discipline that studies the processing of genomic signals. Owing to the major role played in genomics by transcriptional signaling and the related pathway modeling, it is only natural that the theory of signal processing should be utilized in both structural and functional understanding. The aim of GSP is to integrate the theory and methods of signal processing with the global understanding of functional genomics, with special emphasis on genomic regulation. Hence, GSP encompasses various methodologies concerning expression profiles: detection, prediction, classification, control, and statistical and dynamical modeling of gene networks. GSP is a fundamental discipline that brings to genomics the structural model-based analysis and synthesis that form the basis of mathematically rigorous engineering.